

CHEMICAL & ENGINEERING NEWS

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PATENT OFFICE CHIEF AIMS TO REVITALIZE ENTIRE PATENT SYSTEM PAGE 13



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HIGH-ENERGY MATERIALS

*Advanced propellants and
explosives under development
for space, military uses*

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NEWS OF THE WEEK

■ EPA issues proposed rule that would almost double the number of chemicals—from 320 to 633—that U.S. industrial companies must monitor for the Toxics Release Inventory. **Page 4**

■ New technique for making large synthetic proteins of unprecedented size may be applicable to development of new vaccines, biosensors, and peptide libraries. **Page 5**

■ Researchers find superconductivity for the first time in quaternary intermetallic compounds—specifically, yttrium-nickel boride carbides (Y-Ni-B-C) and yttrium-palladium boride carbide (Y-Pd-B-C). **Page 5**

■ Business community and Administration, working on Superfund renewal, are expected to propose hybrid liability schemes to try to satisfy concerns of both industry and insurance companies. **Page 6**

■ Slower growth in drug industry R&D investment in 1994—the lowest rate of increase in 17 years—is projected by the Pharmaceutical Manufacturers Association. **Page 7**

COVER: Photo courtesy of NASA

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BUSINESS

Stock prices rose for many chemical firms last year, largely because of improved earnings performance and cost cutting together with prospects for future earnings growth. **Page 10**

GOVERNMENT

Bruce A. Lehman, new Commissioner of Patents & Trademarks, discusses the need for stronger, more defensible patents, his goals for the reform of the U.S. patent system, and international harmonization of the patent process. **Page 13**

SCIENCE/TECHNOLOGY

NASA hails the success of space shuttle *Endeavour's* mission to repair and service the Hubble Space Telescope as the space agency plans eight shuttle flights in 1994. **Page 22**

ACS NEWS

ACS's Education Division launches teacher training program for fourth- through eighth-grade science teachers as part of the NSF-funded Operation Chemistry initiative. **Page 25**

Official reports of committees that met during the ACS Board meeting in Columbus in December are highlighted. **Page 25**

COVER STORY



A new generation of explosives and propellants for military and space applications is being developed by teams of chemists in industrial and government labs. **Page 18**

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LETTERS

Economic status of chemists

Many thanks to Attila Pavlath for his comment, "Economic Status of Chemists" (C&EN, Dec. 20, 1993, page 45). This topic has been debated for many years, especially during those economic times when massive layoffs and early retirements have occurred.

During the past several years, the American Chemical Society has focused on another important topic, National Chemistry Week and educating the general public about chemistry. I think these efforts have been well received, and we are all proud of our efforts here and should continue to support these programs in the future.

Now, however, I believe ACS should focus on the economic status of chemists as its number-one objective for 1994 and beyond—until some solutions have been worked out. At least, as Pavlath says, let's get started in 1994 by addressing the problem. ACS members and local sections should make their views known to the board of directors on this very important subject.

R. W. Johnson
Savannah, Ga.

Attila Pavlath presented several suggestions for improving the economic status of chemists, namely some sort of certification or licensing, immigration control, and continuing education. While these are all worthy of consideration, I believe that Pavlath omitted another very useful avenue toward expanding job opportunities for chemists; that is, broadening the basic education of chemists.

When I received my undergraduate and graduate degrees in chemistry in the 1950s, laboratory jobs were plentiful for new chemists. Back then, students could fill their schedules with their main interest—chemistry and science courses. Times have changed, but curricula seem not to be keeping pace with changing educational needs and job opportunities.

I believe that if aspiring chemists would broaden their backgrounds, they would find ample job opportunities even in today's tight job market. One example, speaking from personal experience, is the field of environmental health and safety (EHS), where a chemical background is clearly an asset, if not a must. Courses in ecology, environmental issues, pollution control, management of hazardous materi-

als, and hazardous waste would nicely supplement a traditional chemistry curriculum and prepare a student for EHS jobs in industry and government.

Similarly, courses in education could prepare one for a teaching career in secondary or primary education, where a background in the discipline of chemistry would be useful irrespective of the subject taught. Courses in communications, public speaking, technical writing, and computer skills would also offer expanded job opportunities for chemists.

Job opportunities do exist for chemistry majors if they are prepared for and willing to look beyond the laboratory. Perhaps it's time to rethink what a chemist is, and of what a chemist's education should consist.

W. J. Vullo
Environmental Manager
General Electric Co.
Burnt Hills, N.Y.

Publicity stunt

My letter concerns the News of the Week item "Energy Department and auto firms plan joint R&D" (C&EN, Dec. 13, 1993, page 9). In the story, Ford was represented by its vice president for technical affairs; General Motors and Chrysler sent their top public relations people. Of course, "technical affairs" may be an euphemism for public relations at Ford.

The only way higher efficiency can be achieved with the large engines now affected by the benevolent automobile industry is by loading the systems with even more complicated, sophisticated electronic devices to manipulate the combustion process, than are now available. Such elegant exercises as "joint R&D" serve public relations only.

We must imitate the rest of the world by taxing motor fuel to a level that will impel the populace toward small engines. Thus, anything above 2-L displacement is redundant. Since 1974, the largest engine I have driven is in my present car (1.6 L). I get more than 40 miles per gal on the

Correction

- Jan. 3, page 5: The paper on retroelement genetics appeared in *Cell*, 75, 1071 (1993).

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Chemical Company Stock Prices Posted Strong Growth Last Year

■ **Stocks of most firms reflected improving finances for industry; biotechnology stocks hit high at start of 1993**

William J. Storck,
C&EN Northeast News Bureau

Last year was one of slightly improving finances for the chemical industry as earnings, profitability, and other fundamentals slowly increased from the depths of the recession. This increase was not lost on investors who drove many chemical stocks upward.

The main stock market action came late in the year as investors seemed finally to decide the recovery, no matter how slow, was real. The result was record highs set day-by-day by the Dow Jones industrial average. As the Dow Jones average was setting new highs, so was C&EN's market value index of seven major chemical companies, which charts the stock market prices of American Cyanamid, Dow Chemical, W. R. Grace, Hercules, Monsanto, Rohm and Haas, and Union Carbide.

For the Dow Jones average, it was a year of progression from low to high. Granted, there were the natural fluctuations in the index, but the yearly low of 3242 came in January and the high of 3794 came in December. By year's end, the Dow Jones average, at 3754, was almost 14% higher than at the beginning of the year.

For chemical stocks, the picture was much the same. The year began on a fairly good note, with C&EN's seven-company index finishing 1992 at 587.8 (1954 = 100). In March, the index dropped about 6% to a yearly low of 545.8, but from then on it showed generally steady growth until it hit a yearly high of 662.6 in December, then set-

tled back slightly to end the year at 658.5, 21% above the 12-month low and 12% ahead of the start of the year.

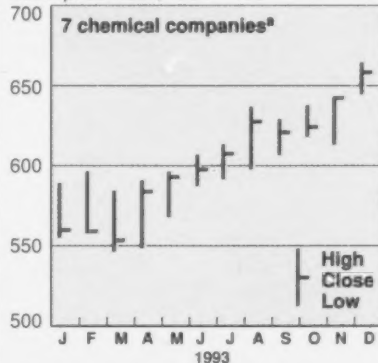
C&EN's broader 30-chemical company index followed much the same pattern as that of the seven-company index, except that the lows and highs each occurred a month earlier than those for the seven-company index and the growth was not as dramatic. The 30-company index, which ended 1992 at 103.7 (1992 = 100), declined 4% to its yearly low of 99.1 in February, then began to rise until it hit its yearly high of 114.7 in November, 16%

higher than its yearly low. Like the other chemical index, it then settled back to end the year at 113.3, almost 15% ahead of the 12-month low and slightly more than 9% ahead of the index at the beginning of the year.

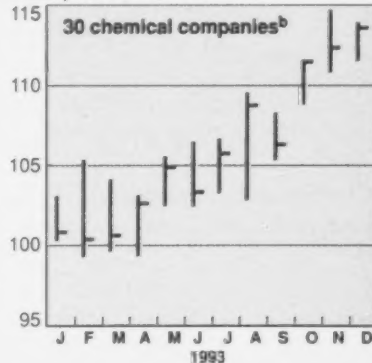
C&EN's biotechnology stock index behaved differently—the high came at the beginning of the year, rather than at the end. This index of the stock value of 11 biopharmaceutical companies reached its 1993 high of 237 (1990 = 100) in January. It then slipped to a low of 148 in April and started to build once again to

Stock market indexes rose rapidly toward end of 1993

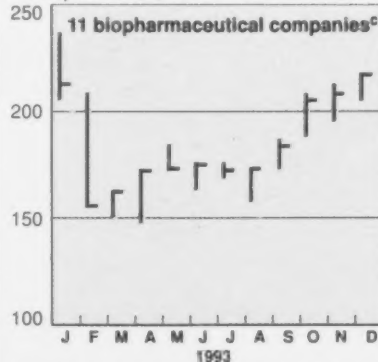
Stock price index, 1954 = 100



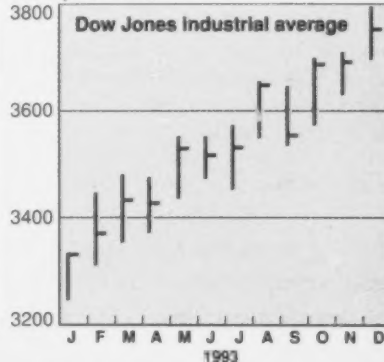
Stock price index, 1992 = 100



Stock price index, 1990 = 100



Stock price index



^a Based on stock prices for American Cyanamid, Dow Chemical, W. R. Grace, Hercules, Monsanto, Rohm and Haas, and Union Carbide. ^b Based on stock prices for 30 chemical companies listed in table on page 11. ^c Based on stock prices for Amgen, Applied Bioscience, Biogen, Centocor, Chiron, Cytogen, Genentech, Genetics Institute, Immunex, Repligen, and Xoma.

end the year at 218, up 47% from the 1993 low and 12% below the opening mark for the year.

While C&EN's chemical indexes (as opposed to the biopharmaceutical index) were moving up in 1993, other indexes of chemical stock performance showed less impressive gains. The Dow Jones industry group index for chemicals increased 7% for the year, with the commodity chemical index moving up 9% and the specialty chemical index growing less than 4%. The differences could arise because the Dow Jones groups include companies with a greater percentage of their business in nonchemical areas. Also, the Dow Jones averages are based solely on stock price, whereas C&EN's indexes are based on market value (stock price times the number of shares outstanding) of the companies.

The individual companies incorporated in C&EN's chemical indexes had mixed stock performance during the year. On the seven-company index, five companies posted increases for the year, with the other two posting declines. However, for the 30-company index, the stock performance of the firms was split much more evenly with 16 advances, 13 declines, and one company unchanged.

By far the biggest advance, and one that did the most to help boost both indexes, was registered by Hercules, whose stock price improved 79% during the year to finish at \$113½ per share. This also was the company's highest stock price of the year.

Other companies posting good gains for 1993 include Morton International, up 54% to \$93½; First Mississippi, up 42% to \$13½; Union Carbide, up 35% to \$22½; Monsanto, up 27% to \$73½; and Lubrizol, up 25% to \$34½.

Earnings performance and cost cutting plus expectations of future earnings growth seem to have driven the stock price of these good performers this year. With the exception of First Mississippi, all of these companies had good earnings growth through 1993. For instance, Hercules' earnings through the first nine months of 1993 were up 24% from the same period a year earlier and rose 27% in both the second and third quarters over the comparable quarters in 1992.

Monsanto's earnings for the first nine months were down slightly from the year-earlier period, but third quarter earnings from operations more than doubled from the same period in 1992. Union Carbide saw 73% growth in

	1993 stock price			% change 1993	Price-earnings ratio ^a	Dividend yield % of price
	High	Low	Close			
Air Products	\$ 48	\$37½	\$ 44¼	-5.3%	25	2.1%
American Cyanamid	58	47	50¼	-12.8	def	3.5
Arco Chemical	47½	39½	43¼	-1.1	22	5.8
Betz Laboratories	62½	41½	43½	-29.1	18	3.2
Cabot	58½	37¼	53½	24.2	30	1.9
Crompton & Knowles	25½	17½	22	-1.1	23	1.8
Dow Chemical	61½	49½	56¾	-0.9	36	4.6
Ethyl	30½	16½	17½	-38.9	8	3.4
First Mississippi	13¼	8½	13½	41.9	def	2.3
H. B. Fuller	42¼	31¼	36	-11.1	17	1.6
Georgia Gulf	23¼	16¼	22½	0	23	nd
BF Goodrich	54	39¼	40¼	-17.6	29	5.5
W. R. Grace	41¼	34½	40½	0.9	def	3.4
Great Lakes Chemical	83½	64½	74½	7.8	13	0.5
Hercules	113½	64¼	113½	78.7	26	2.0
IMC Fertilizer	46½	25½	45½	6.5	def	nd
Imcera	37¼	23	33½	-0.4	def	1.5
International Flavors	118½	99½	113¼	4.6	23	2.8
Loctite	45½	34½	36¾	-19.0	18	2.2
Lubrizol	36¼	26¼	34½	25.2	35	2.6
Monsanto	74¼	49¼	73½	27.3	15	3.2
Morton International	99½	58	93½	53.6	34	1.2
Nalco Chemical	37¼	31½	37½	8.3	19	2.4
Olin	50¼	40½	49½	7.9	40	4.5
Petrolite	40¼	27¼	35	22.8	19	3.2
Praxair	18½	14½	16½	-0.1	24	1.5
Rohm and Haas	61½	47½	59½	11.2	48	2.4
Stepan	37½	25½	28½	-15.4	15	3.0
Union Carbide	22¼	16½	22½	34.6	26	3.4
Witco	31½	24¼	31½	26.9	34	3.1

^a Includes extraordinary and nonrecurring items. def = deficit. nd = no dividend.

profits in the third quarter and 21% for the first nine months. And Morton International's earnings increased 23% in the third quarter and were up 19% through the nine-month period. First Mississippi registered a 54% decline in third-quarter earnings, which caused a 50% drop for the nine months. However, the outlook for growth in fertilizer use plus cost cutting at the company has helped improve the stock price.

The outlook for expanding markets is also helping Union Carbide, where analysts see improvement in sales of polyethylene, one of the company's major products. Optimism about a reorganization at the company also is helping. And at Monsanto, cost reduction, increased sales of chemicals and pharmaceuticals, and expectations for increased demand for agricultural chemicals is helping to push the stock price slightly above some analysts' expectations.

On the down side, Ethyl Corp.'s stock price slid 39% during the year to finish at \$17½ per share. Other companies whose stock prices declined include Betz Laboratories, down 29% to \$43½; Loctite, down 19% to \$36¼; BF Goodrich, down 18% to \$40¼; and Stepan, down 15% to \$28½.

The good news coming out of all of the indexes is that investors are betting on the health of the chemical industry. It has long been accepted that the market is a leading indicator of the economy and that the industry segments of the stock market are pretty fair predictors of the state of those industries about three to six months into the future. If this holds, and there is no reason to doubt that it will, then the chemical industry likely will be seeing a fairly good first half this year compared with the same period of 1993. □